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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Effective on 12/08/2004.  
Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

# FEE TRANSMITTAL

## For FY 2005

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (\$) 100.00

### Complete if Known

Application Number Patent#: 6,740,870 B1  
Filing Date Issued: May 25, 2004  
First Named Inventor Nick Doudoumopoulos  
Examiner Name T. X. Luu  
Art Unit 2878  
Attorney Docket No. M4065.0829/P829

### METHOD OF PAYMENT (check all that apply)

☐ Check ☒ Credit Card ☐ Money Order ☐ None ☐ Other (please identify):  
☒ Deposit Account Deposit Account Number: 04-1073 Deposit Account Name: Dickstein Shapiro Morin & Oshinsky LLP

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☐ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, except for the filing fee  
☐ Charge any additional fee(s) or underpayment of fee(s) under 37 CFR 1.16 and 1.17 ☒ Credit any overpayments

### FEE CALCULATION

#### 1. BASIC FILING, SEARCH, AND EXAMINATION FEES

Application Type	FILING FEES		SEARCH FEES		EXAMINATION FEES		Fees Paid (\$)
	Fee (\$)	Small Entity Fee (\$)	Fee (\$)	Small Entity Fee (\$)	Fee (\$)	Small Entity Fee (\$)	
Utility	300	150	500	250	200	100	
Design	200	100	100	50	130	65	
Plant	200	100	300	150	160	80	
Reissue	300	150	500	250	600	300	
Provisional	200	100	0	0	0	0	

#### 2. EXCESS CLAIM FEES

##### Fee Description

	Fee (\$)	Small Entity Fee (\$)
Each claim over 20 (including Reissues)	50	25
Each independent claim over 3 (including Reissues)	200	100
Multiple dependent claims	360	180

Total Claims Extra Claims Fee (\$) Fee Paid (\$)  
- = x =

Multiple Dependent Claims  
Fee (\$) Fee Paid (\$)

Indep. Claims Extra Claims Fee (\$) Fee Paid (\$)  
- = x =

#### 3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets Extra Sheets Number of each additional 50 or fraction thereof Fee (\$) Fee Paid (\$)  
- 100 = /50 (round up to a whole number) x =

#### 4. OTHER FEE(S)

Non-English Specification, \$130 fee (no small entity discount)

Other (e.g., late filing surcharge): 1811 Certificate of correction

Fees Paid (\$)

100.00

#### SUBMITTED BY

Signature [Signature] Registration No. 28,371 Telephone (202) 828-2232  
Name (Print/Type) Thomas J. D'Amico Date December 28, 2005

Certificate  
JAN 03 2006  
of Correction

JAN 05 2006



Docket No.: M4065.0829/P829  
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Letters Patent of:  
Nick Doudoumopoulos

Patent No.: 6,740,870 B1

Issued: May 25, 2004

For: CLEAR PLASTIC PACKAGING IN A CMOS  
ACTIVE PIXEL IMAGE SENSOR

REQUEST FOR CERTIFICATE OF CORRECTION  
PURSUANT TO 37 C.F.R. §§ 1.322 & 1.323

Attention: Certificate of Correction Branch  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

12/29/2005 SZEWDIE1 00000055 6740870

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Dear Sir:

Upon reviewing the above-identified patent, Patentee noted errors which should be corrected.

In the Abstract, the USPTO made the following error:

Line 2, "fight" should read --light--.

Exhibit A, which is attached, is a copy of a substitute specification filed on June 12, 2003, which corrected the specification but was omitted from the issued patent or included with errors. In the Specification, the following is the amended paragraph which was omitted by the USPTO and should replace the paragraph that begins at Column 1, line 66 and ends at Column 2, line 5:

JAN 05 2006

The final device 10 forms a standard type CMOS die 12 in a ~~totally~~ clear package 14 as shown in Figure 1. The CMOS ~~dies~~, die 12 is, for example, a photosensitive device, for example, an active pixel sensor, with a plurality of electrical connections 108 for electrical signal transfer, ~~for example, an active pixel sensor~~. The perimeter of the packaged device has ~~these~~ electrical connections 106, which are ~~connected~~ electrically coupled to the electrical connections 108 on of the image sensor chip.

Also in the Specification, the USPTO should have deleted the paragraph that begins at Column 2, line 29 and ends at Column 2, line 37, as amended in the substitute specification filed on June 12, 2003. See Exhibit A. The previous paragraph beginning at Column 2, line 6, and ending at Column 2, line 28 is the amended paragraph that replaced the paragraph of Column 2, lines 29-37 on June 12, 2003. See Exhibit A. Therefore, the USPTO made the error of not deleting the paragraph at Column 2, lines 29-37.

**In the Claims, Applicant made the following error:**

Claim 5, column 4, line 8, "and edge" **should read** --an edge--.

The errors were made primarily by the USPTO but were also found in the application as filed by Applicant. Please charge our Credit Card in the amount of \$100.00 covering the fee set forth in 37 CFR 1.20(a). Credit Card Payment Form SB-2038, with a signature from an authorized cardholder, is enclosed. The errors now sought to be corrected are inadvertent errors the correction of which does not involve

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new matter or require reexamination. Transmitted herewith is a proposed Certificate of Correction effecting such amendment. Patentee respectfully solicits the granting of the requested Certificate of Correction.

The Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 04-1073, under Order No. M4065.0829/P829.

Dated: December 28, 2005

Respectfully submitted,

By 

Thomas J. D'Amico

Registration No.: 28,371

Ryan H. Flax

Registration No.: 48,141

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# **Exhibit A**

**Inventor:** Nick Doudoumopoulos

**Atty Docket No.:** M4065.0829/P829

**Application No.:** 09/442,871

**Filing Date:** November 18, 1999

**Title:** CLEAR PLASTIC PACKAGING IN A CMOS ACTIVE PIXEL IMAGE SENSOR

**Documents Filed:**

Amendment (14 pgs)

Submission of substitute specification under 37 CFR 1.125(b)

Submission of replacement drawings (3 pgs)

Amendment transmittal

**Via:**

**Sender's Initials:** TJD/RHF/cz

**Date:** June 12, 2003



cb 6-12-03

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APPLICATION  
FOR  
UNITED STATES LETTERS PATENT

TITLE: CLEAR PLASTIC PACKAGING IN A CMOS ACTIVE  
PIXEL IMAGE SENSOR

APPLICANT

INVENTOR:

NICHOLAS A. DOUDOU MOPOULOS

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**CLEAR PLASTIC PACKAGING IN A CMOS**

**ACTIVE PIXEL IMAGE SENSOR**

[0001] The present application claims priority under 35 U.S.C. § 119 from Provisional Application number 60/111,597, filed November 18, 1998.

**Field Of The Invention**

[0002] The invention relates to CMOS imager devices and plastic packaging thereof.

**Background**

[0003] Image sensors typically are formed using some kind of clear portion to allow light photons to enter the package. Other packaging techniques use plastic injection molds, blown plastics, or plastic transfer molds.

[0004] These techniques use a flow of plastic packing compound into a cavity. The cavity includes ~~the dye~~ an imager die to be packaged, on a lead frame. Once cooled, the package part is removed from the mold, and the leads are trimmed or formed to form the final packaged part.

[0005] Typical materials used in the package molding have been opaque. These materials block incoming light. Hence, when these materials are used to package an optical component, they must be used in a way that does not



interpose packaging material between the light and the component.

[0006] These prior art systems have been used with a preformed plastic cavity or leadless chip carrier. Using these forms, however, ~~has meant into a~~ results in higher package cost.

### Summary

[0007] The ~~present application teaches~~ invention relates to packaging a photosensitive device in a clear package. More specifically, the photosensitive device can be a CMOS image sensor that is packaged in clear QFP (Quad Flat Package) or acrylic. The clear material allows the CMOS image sensor to be packaged in the same way as any other CMOS device. Since the material used to package the device is clear, ~~however,~~ the image sensor can be directly packaged in the package. This new packaging means results in lower cost devices that are more readily integrated with acrylic optics.

### Brief Description Of The Drawings

[0008] These and other aspects will now be described in detail with respect to the accompanying drawings, wherein:

[0009] Figure 1 shows a chip packaging system;

[0010] Figure 2 shows the an imager device in a packaging system as

shown in Figure 1 receiving incoming light; and

[0011] Figure 3 shows a double sided image sensor in a packaging system in accordance with the invention.

### Detailed Description

[0012] The standard cavity mold approach used in CMOS is used according to the present application. The package is formed ~~totally~~ of clear structural plastic, such as QFP, or an acrylic. Optionally, the entire package is transparent. The transfer mold approach is used in its standard way as is known in the art, but modified to use the melting and/or flow temperature for the QFP. The pressure and time in the mold are also modified according to the manufacturer's recommendations. The mold forming cavity may also be modified to allow for features ~~which allow for the~~ and a different ~~viscosity~~ viscosity of the clear mold compound.

[0013] The final device 10 forms a standard type CMOS die 12 in a ~~totally~~ clear package 14 as shown in Figure 1. The CMOS ~~dies~~, die 12 is, for example, a photosensitive device, for example, an active pixel sensor, with a plurality of electrical connections 108 for electrical signal transfer, ~~for example, an active pixel sensor.~~ The perimeter of the packaged device has ~~these~~ electrical connections 106, which are ~~connected~~ electrically coupled to the electrical

connections 108 ~~on~~ of the image sensor chip.

[0014] Figure 1 shows an exemplary embodiment of the package including 14 of the invention and illustrates the different sizes dimensions of the different various package parts features. As shown in figure 1, the package center 102 ~~is inside~~ generally coincides with the imager array center 101. ~~In addition, the~~ The package 14 has a number of different feature size parameters shown, including the size a witch's dimension "A" defining the overall package 14 width, which can be about 550 mills, besides be witch's mills (0.550 inch). Dimension "B" defines an interior width of a cavity 16 for receiving the imager chip (e.g., die 12), which can be about 410 mills, the size see which is mills. Dimensions "C" and "F" define the imager chip widths, which can be about 239 mills, the size of the witch's mills and 224 mills, respectively. Dimensions "D" and "E" define the side lengths of the imager photo array 18, which can be about 112 mill, size the witch's mills and 92 mills, the size mills, respectively. F witch is 224 mills, the size mills. Dimension "G. witch's " defines the length of an electrical connection 106 measured from the edge of the package perimeter to the initiation of the electrical connection's 106 bend region; the dimension can be about 30 mills, the size age witch's mills. Dimension "H" defines another length of the electrical connection 106 measured from the bend region to the electrical connection's 106 terminating

end; the dimension can be about 15 mills, and the size by a which is mills.

Dimension "I" defines a spacing length between adjacent electrical connection members 106 and can be about 39 mills mills.

[0015] ~~An interesting reason for doing this is for the reasons~~ As shown in Figure 2, ~~Incoming~~, light photons such as 200 impinge on the photodetector 199. These ~~are often~~ photons 200 can be accumulated in the silicon substrate under the photogate PG as 202, 204. The accumulated photons are stored as charge or some other form, which can be later read out. However, if the whole package is clear, as shown in Figure 2, then ~~the accumulated~~ photons 200 can be received from any conceivable angle relative to the photodetector 199, such as the angle shown as 205 in figure 2. A window, which would presumably be in the area shown as 210 in Figure 2, would presumably block that photon.

[0016] Another application is shown in Figure 3. The device is packaged with two image sensor elements 300 and 310, which respectively receive incoming light from two different sides 315, 317. Another image sensor 312 can receive light from the top 320. Since the package 299 is clear, the image sensors can be freely located within the package perimeter to receive incoming light from any direction.

[0017] Other modifications are contemplated. For example, other clear

materials may be usable for packaging the chip.

**UNITED STATES PATENT AND TRADEMARK OFFICE  
CERTIFICATE OF CORRECTION**

Page 1 of 2

PATENT NO. : 6,740,870 *bi*  
APPLICATION NO. : 09/442,871  
ISSUE DATE : May 25, 2004  
INVENTOR(S) : Nick Doudoumopoulos

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Abstract, the following error is corrected:

Line 2, "fight" should read --light--.

In the Specification, replace the paragraph that begins at Column 1, line 66 and ends at Column 2, line 5 with the following:

The final device 10 forms a standard type CMOS die 12 in a clear package 14 as shown in Figure 1. The CMOS die 12 is, for example, a photosensitive device, for example, an active pixel sensor, with a plurality of electrical connections 108 for electrical signal transfer. The perimeter of the packaged device has electrical connections 106, which are electrically coupled to the electrical connections 108 of the image sensor chip.

Also in the Specification, delete the paragraph that begins at Column 2, line 29 and ends at Column 2, line 37.

In the Claims, the following error is corrected:

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Claim 5, column 4, line 8, "and edge" should read --an edge--.

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